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Esports, skins and loot boxes: Participants, practices, and problematic behaviour associated with emergent forms of gambling.

Abstract

Twenty years since the internet transformed gambling products and services, the convergence of online games and gambling has initiated a new means of consuming internet-based media. Gambling specifically connected to esports is a significant development, offering not only a new avenue for existing gambling products to be inserted into gaming media, but also affording several novel experiences (e.g. skins and loot boxes). This study assesses participation rates and demographic characteristics of esports spectators who gamble via an international online survey (N=582). The sample highlighted the prevalence of young, often under-age, males in esports-related gambling activities. Participation in gambling, and gambling-like activities, was found to be 67%, with rates of problematic and potentially problematic gambling in the sample being 50.34%. Finally, increased gambling is associated with increased spectating of esports. Although the results are not generalisable to the wider population, they suggest a need for increased attention, from academia and regulators, regarding newly-emergent gambling behaviours in contemporary digital culture.

Keywords: gambling, esports, skins gambling, loot boxes, video games, free-to-play, gamification, problem gambling

Introduction

The preceding decades have seen substantial growth in research addressing gambling, especially in regard to internet-based activities and new media contexts (Lopez-Gonzalez and Griffiths, 2016; Armstrong et al., 2016). In addition to the realm of web-based electronic commerce, new media have brought gambling into many other areas of online life, including social media networks and electronic sports (King et al., 2014; Lopez-Gonzalez and Griffiths, 2016: Macey and Hamari, 2018). Nowhere is this more evident than in the convergence of online gaming and gambling made possible by the internet, mobile communications, and networked online communities (King et al., 2010; Gainsbury et al., 2016). This rapidly evolving environment offers consumers novel opportunities to participate in an ever-increasing range of gambling, and "gambling-like" (King et al., 2010), experiences on the internet.

With the emergence of advanced, mobile communications the practices of both video gaming and gambling have been revolutionised by increased ease of access and sophisticated audio-visual environments (Deans et al., 2016; Abarbanel, 2013). Additionally, novel points of convergence between gambling and new media have appeared such as: esports, free-to-play games, social network games, online practice sites, and virtual economies consisting of online possessions of players. As a result, entirely new consumption practices are being created.

- Table 1 about here. -

This process is not limited to games and gambling, but is part of a wider trend of media convergence (Jenkins, 2006), and has been studied in reference to other, more established, gambling activities such as sports betting (Lopez-Gonzalez and Griffiths, 2016). The blurring of

boundaries between video games and gambling activities has led to a range of problems regarding regulation and legislative issues (Teichert et al., 2017). Although the consequences of this trend are yet to be fully assessed, current concerns include the targeting of vulnerable populations through gambling-like experiences, and increased penetration of gambling using socially-accepted vehicles such as sports and video games (Lopez-Gonzalez and Griffiths, 2016). Allied to these specific concerns are those aspects of internet gambling which may potentially facilitate problematic behaviour, such as increased ease of access and the continuous availability of formerly discontinuous gambling activities (Cotte and Latour, 2009; Gainsbury et al., 2012; Deans et al., 2016).

Esports and Gambling

One of the most notable areas of media convergence today is electronic sports (esports), i.e. competitive video gaming (Hamari and Sjöblom, 2017). Esports are rooted in the Local Area Network (LAN) culture (Jansz and Martens, 2005; Taylor, 2012), however, it is only with the advent of Internet Protocol Television (IPTV) and streaming technologies that they have begun to make the transition from niche culture to international phenomenon (Scholz, 2011; Hamari and Sjöblom, 2017). As esports has grown, a range of related gambling activities has emerged, facilitated by the use of real currencies, virtual currencies, and a range of virtual items. These issues are discussed below, and summarised in tables 2 and 3.

Betting. There are many forms of betting associated with esports, the majority of which are direct analogues of pre-existing practices, for example sportsbook betting (Gainsbury et al., 2017a) and fantasy esports (Tsai, 2015). Similarly, there is evidence of informal betting such as between friends and esports players, with the latter having implications for the integrity of the esports scene as a whole in regard to player conduct and potential match-fixing (Holden and

Erlich, 2017; Brickell, 2017). However, the digital nature of esports has allowed the development of formalised Player-versus-Player (PvP) betting, where players can bet on their own performance when playing a video game (Holden et al., 2016; Grove, 2016).

Casino Games/Themed Games. Almost all forms of casino games (roulette, blackjack, etc.) and simulated slots are available, and are often themed according to popular esports games, most notably "Counter Strike: Global Offensive" (*CS:GO*). Additionally, themed versions of simulated coin-flipping, "rock, paper, scissors", among others, are also available (Gainsbury et al., 2017a; Martinelli, 2017).

Loot Boxes. In many contemporary games players can choose to make small payments in order to open loot boxes (also called: crates, cases, chests, and other similar terms), which are received either as random drops, or as rewards for in-game achievements. These payments are primarily facilitated using real-world currency, but some games also provide "free" loot boxes which can be opened using in-game currency or as rewards for in-game efforts. Those games that do provide payment-free loot boxes also provide the opportunity for players to purchase further loot boxes with real-world currency. Loot boxes contain virtual items which may affect gameplay or may be entirely decorative. The contents of loot boxes are randomly determined (Baglin, 2017) and the total value of the items may, or may not, exceed the price paid to open the case; a real-world analogue are lottery scratch cards. In addition, some loot boxes constitute part of a closed in-game economy, where there is no direct means of exchanging loot boxes, or associated virtual items, for real-world currency. Other games, however, do allow loot boxes and associated virtual items to be directly exchanged for real-world currency, either through in-game marketplaces, third-party services, or a combination of both.

The use of loot boxes began with Free-to-Play games, but has since been adopted by the majority of genres and business models, from independent productions to those produced by major studios. In the final weeks of 2017 the implementation of loot boxes in the game Battlefront 2 initiated a player backlash and community-driven campaign for loot boxes to be categorised as gambling, drawing the attention of both media and regulators (Macey, 2017).

Skins and Virtual Items. The use of virtual items in gambling related to video games includes both those which can be exchanged for real-world currencies, and those that cannot (table 2). Although there are numerous possibilities to gamble with virtual items, the practice is most closely associated with a specific item: the "skin" (Holden et al., 2016). Skins are in-game items, often with a real-world monetary value, that can be either purchased directly from an online market place, or earned in-game by players. Skins are obtained by opening loot boxes and they often have no direct effect on gameplay, being decorative items. The use of virtual goods such as skins in gambling is primarily associated with *CS:GO*, but is also connected to others (Holden and Erlich, 2017; Martinelli, 2017).

Skins, and other virtual items, are used in gambling in two ways. The first is by replacing real world currency as stakes in established gambling activities, ranging from simulated coin-flipping to playing poker (Gainsbury, Hing, Delfabbro, and King, 2014; Woodford, 2013; Martinelli, 2017). The second way skins are used is to access newly-emergent forms of gambling, most of which cannot be directly accessed with any other form of currency. Skins gambling, in its many varied forms, has led to a series of legal disputes which have been well documented (Holden and Erlich, 2017; Martinelli, 2017).

Skins Lotteries. Skins are used as stakes in "lotteries" where the higher a player's stake (as a percentage of the pot) the higher their chance of winning the total pot, essentially a form of "jackpot"-style lottery (Grove, 2016).

Loot Box/Crate Openings. Emerging after the events which affected skins gambling, third-party sites offer players the chance to open unlimited numbers of crates for a reduced fee. As with the skins gambling websites, these sites are unregulated and have been accused of dishonest practices (Lewis, 2017).

Crash Betting. In crash betting, players deposit skins into an account which are then converted into a site-specific currency. Crash betting is essentially a game of nerve: a marker progresses along an exponential curve where the x-axis shows time and the y-axis is the multiplier. The aim is to achieve the highest multiplier before the game crashes, if the player quits before the crash, their stake is multiplied by the value reached on the y-axis, however, if the game crashes before the player quits they lose their stake (esports betting ninja, 2017).

In addition to using real world currencies or virtual items as stakes in gambling activities, participants can also choose between the following alternative options, depending on the individual activity and the host site/game: Digital/Crypto-currencies; site-specific currencies; and, in-game currencies which can be either earned in-game (soft currency), or purchased (hard/premium currency). See table 2, below, for a full summary.

- Table 2 about here. –
- Table 3 about here. –

To date, the majority of research into esports spectators has been conducted by market research organisations, with academia only recently beginning to publish in the area. Current

figures presented by market researchers claim total global esports viewers to be in the region of 385 million, with an approximate 50-50 split between “occasional viewers” and “enthusiasts” (Newzoo, 2017).

According to existing figures, esports spectators have been found to be predominantly young males, more likely to be in full-time employment, and to earn more than non-esports spectators (Gainsbury et al., 2017a). A large section, 40%, of esports spectators do not regularly play the games which they watch, thereby mirroring traditional sports consumption practices (Gainsbury et al., 2017a).

Due to the prevalence of unregulated gambling sites, and the continued state of flux, gambling with skins and other virtual items is hard to quantify. However, in 2016 a total of 6.5 million consumers were estimated to have wagered in excess of $5.5bn on esports related gambling, of which $649m was on sportsbook, PvP, and fantasy sports betting (Grove, 2016).

Similar to esports spectators, a previous study found that the majority of esports bettors were young males with high levels of educational achievement, furthermore, they were likely to more highly engaged with gambling than traditional sports bettors (Gainsbury et al., 2017a).

Legal Context

The practice of gambling is governed by local laws and regulations which can vary widely between, and sometimes even within, countries. For example, in the United States online sports betting remains illegal in the majority of states, but is however legal in Nevada, New Jersey, and Delaware. Gambling related to video games has been subject to increased scrutiny in recent times, most notably in relation to the use of virtual items such as skins, and the use of loot

boxes. In the latter part of 2016 Valve, the publisher of *CS:GO*, was the subject of legal proceedings in the United States which related to the use of skins in third-party gambling websites (Holden and Erlich, 2017; Martinelli, 2017). The outcomes of these cases are notable as the rulings have: a) begun to normalise the activities associated with esports gambling (Canfield, 2017); and b) established that US law does not recognise virtual items as constituting items of value, in contrast to other countries such as the UK (Holden and Erlich, 2017).

Regulatory interpretations in the West are centred around a definition of gambling in which virtual items are deemed not to possess value outside of the game from which they originate. As such, activities which utilise virtual items are not considered gambling in law[1]. This position is one which has been questioned, both in relation to loot boxes (Baglin, 2017; Griffiths, 2018), and other gambling-like experiences associated with games (Gainsbury, Hing, Delfabbro, and King, 2014; King et al., 2014; Gainsbury et al., 2016).

The UK Gambling Act 2005 defines "gambling" as either a) gaming, b) betting, or c) playing a lottery, in turn "gaming" is defined as "playing a game of chance for a prize", where "prize" "means money or money's worth". The prize does not require the return of the original stake when applied to gaming machines (Gambling Act, 2005). By this definition, any purchase of a key to open loot boxes constitutes gambling in the same way as playing an electronic gaming machine. Griffiths (2018) highlights the fact that this is acknowledged by the Gambling Commission in a recent position paper, yet the Gambling Commission maintains that loot boxes are not gambling as they cannot be exchanged outside the game. This is, however, incorrect as

[1] An in-depth examination of the legal issues surrounding virtual items and loot boxes can be found in the special issue of *Gaming Law Review Journal* (Oct, 2017) dedicated to esports-related gambling.

numerous services exist that allow players to exchange virtual game items for real-world currency, services provided by both game developers such as Valve, or third parties[2]. Games such as *Overwatch*, which do not facilitate player to player transfers reimburse players with in-game currency which can be used to purchase items from the game store. Furthermore, online auction sites exist where players can sell their game accounts, and the accrued virtual items, for real-world currency. As such "skin-farming" is facilitated in the same way as the more established practice of "gold-farming" (Heeks, 2009).

A final point which adds a further layer of complexity to the debate is that many contemporary video games require users to accept an End User License Agreement (EULA) which defines in-game items as not having real-world monetary value. However, recent legal judgements by the Netherlands Gaming Authority[2] and the Washington State Gambling Commission (Songer, 2018) have declared that using virtual, in-game, items for gambling is equivalent to using a real-world currency. This is just one example of the larger debate surrounding ownership of digital content and intellectual property rights associated with video games (Prax, 2012; Joseph, 2018: Giddings and Harvey, 2018).

The authors contend that the gambling-like activity of paying to open loot boxes merits inclusion in this research, alongside other forms of gambling facilitated by virtual items, notwithstanding the legal grey area which currently exists. Due to the lack of consensus

[2] During the writing of this article the Netherlands Gaming Authority issued a press release detailing its decision that loot boxes whose prizes can be directly exchanged for real-world currency constitute gambling. Furthermore, all loot boxes, whether paid or free, transferable or non-transferable "are similar to gambling games such as slot machines and roulette in terms of design and mechanisms" and have the potential to become addictive (Netherlands Gaming Authority, 19th April, 2018): https://www.kansspelautoriteit.nl/publish/library/6/press_release_loot_boxes_19_april_2018_-_en.pdf
In addition, the Belgian Gaming Commission also announced a judgement that any paid loot box opening constitutes a game of chance and, therefore, that even games such as *Overwatch*, where there is no possibility to directly exchange prizes for real-world currency, are in violation of their gambling laws (The Belgian Gaming Commission, 25th April, 2018): https://www.koengeens.be/news/2018/04/25/loot-boxen-in-drie-videogames-in-strijd-met-kansspelwetgeving

surrounding the categorisation of paid loot box opening, this work will refer to it as a “gambling-like experience”, and to participants as “loot box purchasers”.

The Present Study

The rapid rise of esports and video game-related gambling, allied with concerns around the nature of internet gambling and the practices evident in media convergence, mean that urgent study is required. This study aims to provide an overview of a newly-emergent behaviour in its relative infancy, thereby laying the groundwork for further studies. Furthermore, it is intended to form one of the first assessments of participation rates and the prevalence of problematic gambling behaviours from an academic perspective.

With these issues in mind, the following research questions guided this study:

- RQ1: What are the demographic characteristics of esports spectators who gamble?
- RQ2: To what degree are spectators of esports participating in gambling activities, either traditional (land-based or internet-based) or related to video games, and which specific activities are favoured?
- RQ3: What are the rates of problematic gambling behaviour in the population of esports spectators, and how do these rates compare to those who participate in established forms of gambling?

Existing research has highlighted that both video gaming and gambling, at a high level of involvement, are activities dominated by males (Forrest et al., 2016; McCormack et al., 2014). Compared to land-based gamblers, online gamblers have been found to be: younger, more often male, more frequent gamblers, to spend more money gambling, to be involved in more forms of

gambling, and more likely to meet criteria for problem gambling behaviour (Goldstein et al., 2016; Edgren et al., 2017; Blaszczynski et al., 2016). Online gamblers have also been found to have attained higher levels of educational achievement, to be employed in full-time work, and to have a higher average income than offline gamblers (Blaszczynski et al., 2016).

Given that esports and video game-related gambling is almost exclusively facilitated online, video game-related gamblers are likely to share much of the same characteristics as online gamblers. Therefore, it is hypothesised that those who both watch esports, and participate in different forms of gambling or purchase loot boxes, will predominantly be: young males, in full-time employment, and to report higher than average levels of income (H_1).

Loot boxes are a mechanic prevalent in all types and genres of contemporary video games, and the virtual items obtained from opening loot boxes are used as stakes in a huge range of gambling activities (Gainsbury et al., 2017a; Martinelli, 2017). Therefore, it is hypothesised that esports spectators who participate in gambling, and gambling-like, activities are likely to participate in a range of activities, accessed via mixed channels (H_{2a}), with betting, purchasing loot boxes, participating in skins lotteries, and using virtual items to play casino games expected to be the most popular individual activities (H_{2b}).

For esports spectators who gamble, or participate in gambling-like experiences, rates of problematic gambling are expected to mirror those found in online gamblers (Gainsbury et al., 2017b) and, therefore, will be higher in this population than other populations (H_3).

It is expected that the results of this work will contribute to identifying and understanding the profile of esports spectators who gamble, or participate in gambling-like experiences, a pressing issue in light of the rapid growth of this population. In addition, by examining the

interactions between watching video games, esports, and gambling services this research hopes to shed light on behaviours which are associated with the development of problematic gambling. The approach of the research is exploratory and atheoretical; the aim is to provide descriptive information regarding those who participate in gambling related to esports and video games.

Methods

Procedure

A link to an online survey was posted on social media sites, such as Facebook and Reddit, on esports discussion forums, and on the social media pages of various national esports associations. The link was introduced with text explaining the aims of the research, who was conducting and funding the research, and eligibility criteria. Potential respondents were eligible to participate if they had played video games and had either watched esports, gambled, or purchased loot boxes within the preceding 12 months. Those respondents who reported opening loot boxes, but not purchasing them were not categorised as loot box purchasers and, as such, were excluded from the analysis.

The survey was only available in English, as was the accompanying text, and was published on English-language sites. As an incentive to participate, respondents had the chance enter a raffle to win a $50 gift card.

The decision to collect data via an online survey was made having examined the characteristics of both the target population and the topic. Online surveys have the benefit of being a far more effective and cost-efficient method for reaching digitally-engaged individuals, such as esports fans, than the established techniques of probability sampling. An issue

acknowledged by established researchers in the field (Griffiths, 2010; Forrest et al., 2016). Furthermore, the anonymising effect of online methodologies has been shown to increase veracity of responses, particularly in regard to sensitive issues such as gambling (Griffiths, 2010).

A total of 2,397 responses were recorded, of which 891 were fully completed. The number of people viewing the link but not participating cannot be ascertained. The survey included a filter question, those that failed the filter were removed from the sample, as were those who reported neither watching esports nor participating in any form of gambling in the preceding 12 months. The final sample consisted of 582 responses, 24.28% of total responses received.

The survey included items which recorded: demographic characteristics of respondents; viewing habits for esports; and, gambling behaviour, both in established contexts (online and offline) and those related to esports, including the gambling-like activity of purchasing loot boxes. For all items relating to individual gambling behaviours, a full list of activities accompanied the item. Respondents were asked to include all types of gambling or gambling-like activity, whether formal (with a licensed company), informal (between friends), legal, or illicit (with unlicensed or unregulated third parties).

In an attempt to mitigate potential fatigue for respondents, while ensuring all types of gambling were represented, gambling activities were grouped according to structural characteristics. A full list of items is shown in Appendix A. For all activities, items recorded: frequency of participation, average weekly hours spent on activity, and average monthly spend.

Analysis was conducted using SPSS version 24, all tests are two-tailed.

Measurement

Consumption Habits. Since the advent of internet-based gambling it has been common practice to distinguish between traditional offline activities and online ones (Gainsbury et al., 2012; Deans et al., 2016). Gambling related to video games is a particular focus of this study, despite the fact that it is facilitated almost exclusively via the internet it was decided that it would constitute a separate category due to the specific context and activities of which it is comprised.

For each individual activity participants were asked to indicate: how often (daily, weekly, monthly, etc.) they participated; their average weekly hours; and, average monthly spend, in US$. For all questions concerning finances a link was included which allowed respondents to enter information in their currency of choice and obtain an accurate conversion to US$. The same information was collected regarding their consumption of esports (viewing habits only), participants were not asked how often they played esports.

For each of the five activities (gambling in three contexts, purchasing loot boxes, and watching esports), a construct relating to overall engagement was formulated by combining the three main indicators: frequency of participation, average weekly hours, and average monthly spend. It was decided that a combined measure would prove most effective as using a single measure, for example frequency of participation, does not provide a holistic picture (Macey and Hamari, 2018). Therefore, values for each of the three measures were converted into scales, from 1 to 6, with 1 showing the lowest involvement and 6 the highest. An average of the three scale was calculated, thereby indicating overall engagement. For esports engagement, the ready availability of free content means expenditure is not as significant an indicator as either

frequency or average weekly hours. Therefore, when calculating engagement, average monthly spend was allocated a 50% weighting.

Problem Gambling. The Problem Gambling Severity Index (PGSI) is a widely used self-assessment tool derived from the Canadian Problem Gambling Index (CPGI; Ferris and Wynne, 2001), consisting of nine items. Possible responses to the items are "never", "sometimes", "most of the time", and "almost always", and are scored as follows: "never" = 0, "sometimes" = 1, "most of the time" = 2, and "almost always" = 3. Respondents with total scores of 0, 1-2, 3-7, or 8 or more are categorised as "non-problem gamblers", "low-risk gamblers", "moderate risk gamblers", and "problematic gamblers", respectively. Cronbach's alpha for the present study was $\alpha = .823$.

Analysis

Consumption habits, relating to both the context of gambling and specific activities, were crosstabulated with esports engagement in order to investigate potential relationships. Due to low counts in several cells in each of the tables, Fisher's exact test was used in place of Pearson's chi-squared test, additionally Somers' delta (Δ) and Kendall's tau (τ) were performed to ascertain predictive power (Δ) and direction of association (τ). Somers' delta is an asymmetric test, as such esports engagement was used as the independent variable. All tables were square, as such Kendall's tau-b was reported, with $\tau < 0.1$ showing a weak relationship, $0.1 < \tau < 0.2$ indicating a moderate relationship, $0.2 < \tau < 0.3$ a moderately strong relationship, and $0.3 < \tau < 1$ a strong relationship (Pollock, 2011).

Results

Demographics

As shown in table 4, the final sample skews male (91.9%) and young, with 27% being under 18 years of age, and a further 31.3% being in the age range 18-21. The youthful nature of the sample is also reflected in the educational level and current employment status of respondents. The most common nationality recorded was American, 35.6%, followed by British, 7.9%, Finnish, 7%, and Canadian, 6.7%, in total responses were provided by 61 different nationalities.

-Table 4 about here.-

Gambling Habits

A total of 51% of respondents reported both spectating esports and gambling within the preceding 12 months, this figure rises to 67.18% when including the gambling-like experience of purchasing loot boxes. A further 7.4% reported gambling but not watching any esports, rising to 8.25% including the purchase of loot boxes. The remaining 24.57% reported watching esports, but not gambling in the previous 12 months. Among those that had gambled, there was a clear preference for using multiple channels to access gambling content with 57.6% using two or more channels compared to 42.4% using only a single channel (i.e. offline only, online only, or video game-related only). With the inclusion of loot box purchases the divide is even more pronounced: 61.6% using multiple channels to access gambling and gambling-like experiences, in comparison to 38.4% accessing gambling or gambling-like content via a single channel.

The most popular of all individual gambling activities was video game-related betting with 19.8% of respondents having reported participating within the preceding 12 months (table 5). This was followed by: *online betting* (26.8%); *offline lottery* (22.9%); and *offline betting* (17.9%). When considering loot box purchases alongside established gambling activities, a similar picture emerges, with the exception that the most popular activity is now *loot box purchasing*, with 42.6% of those who participate in gambling or gambling-like experiences having reported paying to open loot boxes (table 5).

- Table 5 about here -

Investigating levels of engagement with gambling, and purchasing loot boxes, in respect to level of engagement with esports (Appendix B) shows clear evidence of strong associations across all four contexts, *offline* ($p = <.001$), *online* ($p = .007$), *video game-related* ($p = < .001$), and loot box purchasing ($p = .039$). However, only *online* ($\Delta = .077$, $\tau = .073$, $p = .049$) and *video game-related* ($\Delta = .240$, $\tau = .219$, $p = < .001$) show clear monotic relationships, which are of moderate and moderately strong, respectively. We can see, therefore, that increased spectating of esports is associated with increased levels of gambling both online and directly related to video games.

Considering individual gambling activities related to esports engagement reveals a number of statistically significant relationships. In the offline context, average weekly hours spent betting, playing Electronic Gambling Machines (EGMs), and playing lotteries are associated with esports engagement, ($p = .037$), ($p = .004$), and ($p = .004$) respectively. However, it is only the first two which show clear relationships of moderate strength. Offline betting has a positive correlation ($\Delta = .181$, $\tau = .136$, $p = .003$), while playing the lottery has a negative correlation ($\Delta = -.393$, $\tau = -.088$, $p = .004$). Average monthly spend on offline EGMs also shows

a clear association with esports engagement ($p = .010$), but once again the exact nature of this relationship is unclear from the data.

Examining online gambling activities shows that average weekly hours spent playing dice games has a statistically significant relationship to esports engagement, with a p value of .030 although, potentially as a result of the small number of cases, the exact relationship is unclear. Additionally, average weekly hours spent online betting shows a clear, positive relationship, of moderate strength, with esports engagement ($p = .014$) ($\Delta = .225$, $\tau = .183$, $p = .001$).

Unsurprisingly, it is in the context of video games where the strongest associations between gambling/gambling-like experiences, and esports engagement exist. The most notable relationships are in respect to video game-related betting, with both average weekly hours and average monthly spend displaying strong positive associations, ($p = <.001$) ($\Delta = .399$, $\tau = 0.3$, $p = <.001$) and ($p = <.001$) ($\Delta = .343$, $\tau = .245$, $p = <.001$) respectively. An unexpected finding was that both average weekly hours and average monthly spend for purchasing loot boxes have significant, negative relationships, of moderate strength, with esports engagement, ($p = <.001$) ($\Delta = -.180$, $\tau = -.131$, $p = .002$) and ($p = <.001$) ($\Delta = -.149$, $\tau = -.148$, $p = .002$) respectively.

Examining the specific channels used to access gambling, and gambling-like experiences, provides few meaningful results as, due to the number of contexts examined in this work, many categories are small. For example, 15 respondents reported gambling online only. In total there were 15 specific categories ranging in size from $n = 8$ to $n= 68$ (see Appendix C).

We can, however, infer certain patterns from the breakdown of channels used to access gambling. Online and VG gambling are usually accessed alongside other gambling channels. We

can see this by comparing online only (n=15) and VG gambling only (n=21) to online and others (n=118) and VG and others (n=107), an eight- and five-fold increase, respectively.

Loot Box Purchasers

Of the total respondents, 13 reported opening loot boxes but not paying to do so, as such they were excluded from analysis. However, of these 13, four reported using the skins obtained via loot box opening in other gambling activities such as skins lotteries and stakes for playing poker. Similarly, 121 (of 177) respondents who reported opening crates also reported using skins to gamble.

Problem Gambling Assessment

Rates of problematic gambling behaviour in the sample appear substantial, with those classified as either being problematic gamblers, or at moderate or low risk of developing problematic behaviour totalling 50.3% of the sample, with rates of 4.5%, 18%, and 27.8%, respectively (Appendix C).

As above, the ability to examine problematic gambling in regard to specific channels used to access gambling, and gambling-like, content is restricted due to small group sizes. However, we can see that rates of problematic and potentially problematic gambling correlate with the number of channels used to access gambling content: for those who use a single channel to access gambling content, rates of problematic and potentially problematic gambling total 44.2%, compared to rates of 81.7% and 83% for users of two and three channels, respectively

(Appendix E). As can be expected, the majority of respondents fall into “low-risk” and “moderate-risk” categories, with 2.9% of single-channel users and 2.4% of two-channel users being rated as “problem gamblers”. For those who use all three channels (*offline, online, and video game-related*) to access gambling, the number of “problem gamblers” rises to 17%.

Assessing PGSI in respect to the level of engagement with different channels used to participate in gambling, or gambling-like experiences (Appendix D), reveals statistically significant associations across all contexts, whether *offline, online, video game-related gambling,* or *purchasing loot boxes* with p values of <.001 for all. All relationships are positive, with both *online* and *video game-related gambling* being significantly stronger than *offline gambling and loot box purchasing*, ($\Delta = .437$, $\tau = .402$, $p = <.001$), ($\Delta = .479$, $\tau = .424$, $p = <.001$), ($\Delta = .208$, $\tau = .188$, $p = <.001$), and ($\Delta = .213$, $\tau = .172$, $p = <.001$) respectively.

Discussion

Investigating relationships between the online spectating of esports and gambling products reveals that as engagement with esports grows, so too does engagement in both the range of gambling activities and the range of channels through which gambling services are accessed. Furthermore, the rates of problematic and potentially problematic gambling behaviour observed in the sample were high (50.34%).

The predominance of males in the sample (table 4) supports H_1, at first sight this seems to be a heavily-skewed distribution. However, it echoes results from several other studies who report rates of 85% for engaged esports fans in the US (Statista, 2017), attendees at LAN events (Jansz and Martens, 2005), and for video game stream consumers (Sjöblom et al., 2017).

Furthermore, rates of around 93% for internet gamblers have been reported (Gainsbury et al., 2012; Gainsbury et al., 2015), although characteristics can vary according to country and gambling activity (Wood and Williams, 2011).

Similarly, the fact that the sample features a high number of adolescents and young adults (table 4) further supports H_1, although the skew is stronger than anticipated, and highlights the consumption of video game-related gambling by those who are legally under-age. However, the skew towards youth means that specific elements of H_1 (employment status and income) were not realised. This can be explained by the fact that the high numbers of respondents still in full-time education have not yet had the opportunity to establish a career for themselves.

Esports spectators were found to access gambling services in a number of different ways, with higher rates of esports engagement correlating with increased number of channels used to access gambling (Appendix F). Furthermore, video game-related gambling and online gambling were relatively unpopular means to access gambling in isolation, but significant numbers of respondents combined them with other channels. Together these findings support H_{2a}. This is in line with previous research which highlights the need for caution when talking of gambling channels as being mutually exclusive (Wardle and Griffiths, 2011).

A further point of interest is that the three least popular contexts were found to be *online only*, *offline and online*, and *offline and video game-related*. These results demonstrate that traditional, land-based gambling is not as popular a means of accessing gambling activities for viewers of esports as new media channels. Taken together, these findings are a clear demonstration of the connections between video game-related gambling, the purchase of loot boxes, and online gambling.

Finally, those spectators who are highly engaged in esports participate in gambling, and gambling-like, activities at a higher rate (74.6%) than those who have either low (64.3%) or moderate (59.8%) levels of engagement. This lends weight to the findings of previous research which note correlations between esports consumption and increased gambling activity (Macey and Hamari, 2018).

In respect to individual activities, purchasing loot boxes and video game-related betting were the two most popular, with participation rates of 46.2% and 30%, respectively (table 5). As such, H_{2b} is partially supported.

Considering the popularity of loot box opening, it is interesting that both *average weekly hours* and *average monthly spend* for this activity show negative associations, of moderate strength, with esports engagement. It is possible that those who are heavily engaged with esports view the opening of cases negatively, due to their associations with less desirable aspects of the esports community (Lewis, 2017).

Although the number of respondents that reported not paying to open loot boxes was small, a significant percentage (30.8%) were found to use the skins to facilitate gambling activities. For those who did pay to open loot boxes, the percentage who then used skins as wagers for gambling more than doubled (68.4%). Loot boxes are the primary source by which skins are obtained, and this is evidence of a strong relationship between loot box opening (paid and unpaid) and gambling. Thereby highlighting the complicated nature of gambling related to video games and the need to establish clear terms of reference in regard to the use of virtual items.

Betting accounts for three of the top five most popular gambling/gambling-like activities (table 5), providing evidence that it is a significant activity for spectators of esports. These findings support previous work which has found associations between the consumption of video games and a preference for games of skill (Forrest, et al., 2016).

Finally, the expectation that using skins and other virtual items would be a popular way to access casino games (H_{2b}), was not realised. The low levels of participation in skins lotteries, and in the use of skins to access online casino games (table 5), may be accounted for by the fact that the data was collected shortly after the events of late 2016 which questioned common practices in the skins-betting ecosystem (Holden and Erlich, 2017).

Analysis of gambling engagement in respect to esports engagement (Appendix B) shows clear and meaningful evidence that increased esports spectating is associated with increased participation in gambling activities related to video games.

The findings of this research support H_3 as rates of problematic and potentially problematic gambling were found to be substantial, with a combined rate of over 50% (Appendix C). These results echo previous research, which has found higher rates of problematic gambling in internet gamblers when compared to offline gamblers (Wood and Williams, 2011; Gainsbury et al., 2014) and for those who participate in sports betting (Hing et al., 2016). However, the degree of problematic gambling evident in this sample was unanticipated, and as such requires additional scrutiny. Further study is required in order to ascertain whether it is a characteristic of the gathered sample, or if the PGSI is the most suitable measure for this type of behaviour.

Less than 50% of single channel gamblers were classified being problematic or potentially problematic gamblers, compared to over 80% of those who gambled across all

channels, whether considering only established gambling activities or, additionally, the purchasing of loot boxes (Appendix C). While causality cannot be determined, it seems that those who utilise more channels to participate in gambling are more likely to display problematic gambling behaviours. This finding is in line with previous research (Blaszczynski et al., 2016).

Limitations

The most significant limitation of this research is the use of an online survey to collect data, as such it is open to the standard criticisms including that respondents were self-selected, that the findings lack generalisability, and that certain behaviours may be over- or under-represented. Additionally, the characteristics of social media platforms used to gather data may have influenced the sample. As such, the rates of problematic and potentially problematic gambling are potentially biased by both the nature of the sample selection and non-representative nature of the sample, potentially resulting in an inaccurate estimate of the true rates in the population of interest as a whole. The findings of this work, therefore, are indicative of the current situation and further work is required which utilises alternative sampling methods in order to produce generalisable findings.

The potential problems of the data-gathering method are, however, mitigated by several factors. First, the sample is not small (n=582), meaning that intentionally misleading responses are likely to be minimised. Second, that social media platforms, such as reddit, has been found to be as reliable sources for collecting data as either paid recruitment or using university students, which are themselves popular means of collecting data (Jamnick and Lane, 2017). Finally, it is not only online surveys to which the aforementioned criticisms can be applied, according to

Griffiths (2010) using online surveys to collect data has a number of important advantages over other methods, most notably access, global reach, and accuracy of data collection.

This research seeks to describe a population that is heavily engaged in the digital environment, therefore, traditional probability sampling is unlikely to generate a meaningful number of responses. In addition, the anonymity provided to respondents means that they are more likely to feel comfortable providing information about such sensitive topics as gambling or addiction, with responses being less likely to be guided by the desire to provide socially-acceptable answers (Griffiths, 2010).

The fact that the majority of responses were from Western European and North American countries (Table 5) may be perceived as a limitation, however, a total of 61 different nationalities, from all continents, were recorded. Such diversity brings significant depth to the results due to the diversity of experiences and attitudes captured, mirroring the global reach of contemporary esports and addressing the concerns of previous researchers (Forrest et al., 2016).

Finally, participants were only asked about their gambling history in the 12 months preceding the research. As such, no conclusions can be drawn as to whether the sample consists of those who are new to gambling, or if it reflects existing gamblers who have since become interested in esports gambling. Although research exists which supports the latter interpretation (Gainsbury et al., 2017b), the prevalence of adolescents and young adults in the sample would suggest their opportunities to gamble have been limited by their age. In summary, it is likely that the sample includes a mixture of those who are existing gamblers, and those who are new to gambling.

Implications and Concluding Remarks

A feature of the data gathered in this research was the number of young people who reported participating in gambling connected to video games and esports, with almost 75% aged 25 or under. Much of these activities are facilitated by virtual items and are conducted via illicit and unregulated websites. In combination with the high rates of problematic gambling indicated by this work, we can see that there is a pressing need for increased attention from both regulators and scholars. The continued proliferation of video games and esports into mainstream culture assures us that this need will only become more acute. Indeed, purchasing loot boxes was found to be the most popular individual activity, demonstrating that traditional definitions of gambling require attention, and possible re-negotiation in light of newly-emergent practices.

This research marks the first step in identifying both the participants and the specific practices of a newly-emergent, but rapidly growing phenomenon: the convergence of gambling and the consumption of video games in the form of online esports. Accordingly, there remains a great deal of work to be done in the area, most notably in renegotiating established concepts of gambling in light of the contemporary online environment. Another key task would be to conduct probability-based sampling in order to establish prevalence rates of gambling in the esports community which can be compared to the general population. Other avenues of potential future work include: investigating the motivations for gambling connected to video games and esports, comparing them with those of established gambling activities, and mapping the ecosystem in which esports and gambling co-exist. Indeed, the scope for future work is significant due to the novelty of this field, requiring both qualitative and quantitative approaches to answer the many questions that will continue to be raised as the phenomenon grows in both social and economic importance.

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Tables

Point of Convergence	Description	References
Free-to-play (F2P) games	Game mechanics which blur boundaries between game play and gambling.	Hamari and Järvinen, 2011; Hamari and Lehondivirta, 2010
Social Network Games	Gambling is integrated into social media platforms.	Paavilainen et al., 2013
Online practice sites	Gambling-like experiences are offered, but with no chance to withdraw “winnings”.	Gainsbury et al., 2016
Virtual economy	Use of virtual items linked to player’s game accounts as stakes in gambling activities.	Hamari and Keronen, 2017; Holden et al., 2016; Lehdonvirta and Castronova, 2014
Esports	The “sportification” of video games facilitates increased social penetration of gambling.	Lopez-Gonzalez and Griffiths, 2016; Macey and Hamari, 2018

Table 1: Points of convergence between gaming and gambling.

Type	*Sub-type*	*Description*	*Example*
Real World Currency (RWC)	-	Standard payment options made using credit cards, or services such as PayPal, etc.	US$, GBP, EUR, etc.
Digital/Crypto-Currency (DCC)	-	Payments made using client's digital "wallet"	Bitcoin
Site-Specific Currency (SSC)	Transferable	Payments are converted into currencies which can only be used on the specific site, can be cashed-out (exchanged for RWC/DCC etc.)	HEROcoin (Herosphere.gg/Firstblood.io)
	Non-Transferable	Payments are converted into currencies which can only be used on the specific site, cannot be cashed-out (exchanged for RWC/DCC etc.)	Unikoins (Unikrn.com)
In-Game Currency (IGC)	Soft	Earned through gameplay, non-transferable	"Blue Essence", from "League of Legends"
	Hard/Premium, Transferable	Purchased using RWC, can be exchanged for RWC via marketplace or 3rd party sites	"FIFA Coins", from "FIFA Ultimate Team"
	Hard/Premium, Non-Transferable	Purchased using RWC, exchange for RWC is prohibited by EULA	"Riot Points", from "League of Legends"
Virtual Items (VI)	Transferable	Earned or purchased (RWC, DCC, IGC), can be exchanged for RWC via marketplace or 3rd party sites	Skins from "Counter-Strike: Global Offensive"
	Non-Transferable	Earned or purchased (RWC, DCC, IGC), exchange for RWC is prohibited by EULA	Skins from "Overwatch"

Legend: RWC = Real-World Currency; DCC = Digital/Crypto Currency; SSC = Site-Specific Currency; IGC = In-Game Currency; VI = Virtual Items; EULA = End User Licence Agreement; GBP = British Pounds (£); EUR = Euros (€)

Table 2: Forms of Currency Used to Access Gambling Activities Associated with Esports

Activity		*Activity Providers*	*Non-video Game Analogue*	*Stakes accepted (see table 2)*
Primary Descriptor	*Secondary Descriptor*			
Betting	Sportsbook	Reg., Unreg.	Traditional Sportsbook	RWC, DCC, IGC, SSC, VI
	Fantasy sports	Reg., Unreg.	Traditional Fantasy sports	
	PvP	Unreg.	Informal Betting	
Casino/Themed Games	Roulette, Blackjack, etc.	Unreg., In-Game	Traditional Casino Games	RWC, DCC, IGC, SSC, VI
	Dice, Coin-Flipping	Unreg., In-Game	Traditional Dice Games, or Tossing of a Coin	
	"Rock, Paper, Scissors", "Minesweeper"	Unreg.	Traditional forms of both digital and non-digital games	
Loot Boxes	In-game	In-Game	Lottery Scratch card	RWC, DCC, IGC
	Third-party case opening sites	Unreg.	Lottery Scratch card	RWC, DCC, VI
Skins and other Virtual Items	As stakes in established activities (e.g., betting, casino games, etc.)	Unreg.	use of money/casino chips	VI
	Skins Lotteries	Unreg.	Sweepstake/Jackpot Lottery	
	Crash Betting	Unreg.	n/a	

Legend: Unreg. = Unregulated 3rd-party Operators; Reg. = Regulated 3rd-party Operators; RWC = Real-World Currency; DCC = Digital/Crypto Currency; SSC = Site-Specific Currency; IGC = In-Game Currency; VI = Virtual Items.

Table 3: Gambling Activities Associated with Esports.

Descriptive Statistics

		n	*Percent*
Age	*Information Not Provided*	11	1.9
	14 or Under	11	1.9
	15 - 17	146	25.1
	18 - 21	182	31.3
	22 - 25	96	16.5
	26 - 29	69	11.9
	30 - 33	31	5.3
	34 - 37	12	2.1
	38 - 41	11	1.9
	42 - 45	10	1.7
	46 - 49	2	0.3
	50 or Over	1	0.2
Gender	*Male*	535	91.9
	Female	32	5.5
	Other/Non-Binary	4	0.7
Employment Status	*Employed Part-time*	51	8.8
	Employed Full-time	147	25.3
	Student	324	55.7
	Unemployed	49	8.4
Nationality	*American*	207	35.57
	Australian	18	3.09
	British	46	7.9
	Canadian	39	6.7
	Finnish	41	7.04

	German	27	4.64
	Others	193	33.16

Table 4: Descriptive Statistics of Sample.

*Participation in Individual Gambling Activities**

		n	*%* *(gamblers n=340)*	*%* *(gamblers + loot box purchasers n=383)*
Offline	*Lottery*	78	**22.9**	**20.4**
	Betting	61	**17.9**	15.9
	Casino Games	13	3.8	3.4
	Electronic Gaming Machines	17	5	4.4
	Card Games (not poker)	38	11.2	9.9
	Poker	50	14.7	13.1
	Dice	12	3.5	3.1
Online	*Lottery*	20	5.9	5.2
	Betting	91	**26.8**	**23.8**
	Casino Games	26	7.6	6.8
	Electronic Gaming Machines	5	1.5	1.3
	Card Games (not poker)	17	5	4.4
	Poker	27	7.9	7
	Dice	7	2.1	1.8
	Skins Lottery	47	13.8	12.3

Video Game-Related	*Betting*	115	**33.8**	**30**
	Fantasy Esports	14	4.1	3.7
	P2P Betting	9	2.6	2.3
	Casino Games Using Skins	23	6.8	6
	Card Games Using Skins (not poker)	4	1.2	1
	Poker Using Skins	4	1.2	1
	*Loot Box Purchasing***	177	-	**46.2**

*Activities are not mutually-exclusive, percentages have calculated using total number of gamblers.

**Purchasing loot boxes has been separated from established forms of gambling due to its debated status.

Table 5: Frequency of Gambling Activities in Preceding 12 Months